UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/761,240	01/17/2001	Josef-Georg Bauer	GR 98 P 2124 P	5138

27346 7590 11/19/2007

LERNER GREENBERG STEMER LLP
FOR INFINEON TECHNOLOGIES AG
P.O. BOX 2480
HOLLYWOOD, FL 33022-2480

EXAMINER	
MONDT, JOHANNES P	

ART UNIT	PAPER NUMBER
3663	

MAIL DATE	DELIVERY MODE
11/19/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	09/761,240	BAUER ET AL.	
	Examiner	Art Unit	
	Johannes P. Mondt	3663	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *27 September 2007*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *9 and 10* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *9 and 10* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

A request for continued examination ('RCE') under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 9/27/07 has been entered.

Response to Amendment

Amendment filed 9/27/07 together with said RCE forms the basis for this office action. In said amendment, applicant cancelled all previously pending claims and added new claims 9 and 10. Comments on Remarks submitted with said amendment are included below under "Response to Arguments".

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

1. ***Claims 9 and 10*** are rejected under 35 U.S.C. 103(a) as being unpatentable over Schulze (5,610,415) in view of Rosling et al (IEEE Transactions on Power Electronics, Vol. 9, No. 5, September 1994, pages 514-521).

Schulze teaches a power semiconductor element, namely a GTO thyristor (title, abstract and col. 1, l. 5-32) comprising:

an emitter region 4 (either n-doped or p-doped; see col. 1, l. 47-col. 2, l. 37); and

a stop zone 9 (col. 2, l. 3-43) in front of said emitter region (namely in region 9; see Figure),

said stop zone and emitter region having opposite conductivities (having foreign atoms, and, in the case of n-doped emitter 4 said stop zone having atoms of p-type conductivity, such as for instance gold (Au), cadmium (Cd), zinc (Zn), or nickel (Ni); in the case of p-doped emitter 4 having foreign atoms of n-type conductivity such as barium (Ba), molybdenum (Mo), niobium (Nb), or cesium (Cs) (see col. 2, l. 11-20). Hence, said emitter region and said stop zone have mutually opposite conductivities, namely n- type and p-type, or p-type and n-type, respectively.

Schulze does not explicitly teach the limitation that said foreign atoms are either sulfur atoms or selenium atoms, on account of which they have at least one energy level within the band gap of the semiconductor and at least 200 meV away from both valence and conduction band of said semiconductor, being silent on the material embodiment of the semiconductor in explicit terms. However, it would have been obvious to include said limitation because it would have been obvious to select silicon for said semiconductor, because thyristors are in their most common embodiment made of a silicon semiconductor layer, as witnessed for instance by Rosling et al: e.g., see Abstract, second paragraph, and "I. Introduction", page 514, second column, second paragraph). With the standard selection of silicon as the thyristor's semiconductor

material the above foreign atoms meet the limitation "with at least one energy level within the 'and gap of the semiconductor (i.e., silicon) and at least 200 meV away from both a conduction band and valence band of the semiconductor (silicon). *Motivation* to select silicon for the semiconductor embodiment following Rossling et al derives at least from the well-tested and cheaply manufactured device thus configured and is strongly suggested by Rossling et al themselves (see page 514, first column, "Introduction", first five (5) lines. Furthermore, although neither Schulze nor Rossling necessarily teach the specific selection of either sulfur or selenium for said atoms Applicant is reminded that it has been held that mere selection of known materials generally understood to be suitable to make a device, the selection of the particular material being on the basis of suitability for the intended use, would be entirely obvious. In re Leshin 125 USPQ 416. *Combination of the teaching by Rosling et al with the invention by Schulze immediately satisfies said limitation* because gold (as acceptor (A): 290 meV), barium (as donor (D): 320 meV), cesium (as donor (D): 300 meV), molybdenum (300 meV), nickel (as acceptor (A) 350 meV) have at least one energy level within the band gap of silicon and 200 meV away from both the conduction band and valence band of silicon, as witnessed by the collected and evaluated data in Sze as made of record 5/15/02, page 21, Figure 13. Because said additional foreign atoms in stop zone 9 of conductivity type opposite to that of the emitter region 4 the concentration of dopants within said stop zone 9 is elevated in comparison with the remainder of the adjoining base region 1, and hence the essential characteristics of the doping profile as claimed are met (see applicants' specification, page 6).

In the combined invention the limitation "said stop zone is only partially electrically active in the on-state and fully electrically active in the off-state for carriers emitted by the emitter region" is satisfied by admission by Applicant, because Applicant admits that said performance is achieved because of "the creation of energy levels by the doping atoms, within the band gap of the semiconductor material, lie far away from the energy levels of the conductance band and the valence band" (see [0011] in the published application or page 3 of the Specification as originally filed).

Also, in reference to the claim language referring to the aforementioned limitation; intended use and other types of functional language must result in a structural difference between the claimed invention and the prior art in order to patentably distinguish the claimed invention from the prior art. If the prior art structure is capable of performing the intended use, then it meets the claim.

Response to Arguments

Applicant's arguments filed in said Remarks have been fully considered but they are not persuasive, even when applied to the claim language as currently amended. In particular, counter to applicant's statements (pages 4-7) in traverse based on the failure by the prior art to teach either sulfur or selenium atoms in the stop zone and based on the doping profile of said sulfur or selenium atoms in said stop zone, the requirements to perform the function of selenium or sulfur dopants in the stop zone are clearly met for the overwhelmingly predominant embodiment of GTO thyristors as silicon controlled rectifiers (see, for example, the statement in the secondary reference Rossling on the

similarity of GTO thyristors with SCRs (silicon-controlled rectifiers) in the beginning of the Introduction (page 514, first column), whereby the constitution of the GTO thyristor out of silicon is not only met by Rossling but is shown to be the standard. Combination of the teaching by Rossling on silicon with the embodiments as listed in the primary reference for the dopants meet all the functional requirements of said dopants because they have sufficiently deep levels, as discussed in the previous office action, and as specifically mentioned in the rejections, both previous and current. Applicants' emphasis on doping profile is only relevant to the extent that indeed a surrounding of the stop zone with space charge is achieved, which is true for Schulze, because stop zone 9 is of a conductivity type opposite that of both regions 1 and 4, which is, in conjunction with having dopants of the claimed energy level of said dopant, sufficient to become fully active as donors, according to applicant's admission (see page 6 of the original specification, lines 11-16). The profile shown in Figure 2 of the Specification is only typical for a succession of regions in a laminate when said regions have comparable but opposite conductivity type doping. Applicants' insistence on either sulfur or selenium is not consistent with patentability requirements long practiced by the USPTO; see MPEP 2144.07.

Furthermore, counter to applicant's argument (pages 8-9) on an alleged teaching away by Schulze on account of a teaching of a temperature-dependent donor activity level of the foreign atoms by Schulze, such behavior is the inherent property of having energy levels that are a substantial energy level difference away from the conduction band edge, and hence apply equally to selenium and sulfur. Moreover, applicant

appears to misconstrue Schulze in juxtaposing the selenium and sulfur dopants with boron: boron is not the selection of choice for the foreign atoms *additionally* introduced in stop zone 9, as opposed to their use as the background dopants for region 1 as a whole, including 9; but instead the recited foreign atoms satisfy the energy level limitations as claimed in the presence of the standard option of the semiconductor material on which the GTO thyristor is based (see Schulze col. 2, l. 3-20).

In response to Applicant's argument on limited solubility (page 10), said limited solubility of selenium and sulfur appears at best to be an incentive only to prefer boron for the background dopant in the stop zone, which is what Schulze does anyway, Keeping in mind that the recited foreign atoms are only needed to enhance beyond background level.

In response to applicant's final comment on the importance of profile: the profile in Figure 2 of the Specification only is important to confirm applicant's own admission of the criterion for the difference in activity levels in the ON and OFF states (pages 6-7 of the Specification), being dependent upon a substantial depletion effect.

Accordingly, none of the arguments appear persuasive, and the new claim language stands rejected over the prior art of record and as cited in the previous office action.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Johannes P. Mondt whose telephone number is 571-272-1919. The examiner can normally be reached on 8:00 - 18:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jack W. Keith can be reached on 571-272-6878. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

JPM
November 13, 2007

Primary Examiner:
Johannes Mondt (Art Unit: 3663)